AMENDMENTS TO THE CLAIMS

Please amend the claims as follow. Insertions are shown underlined while deletions are ~~struck through~~.

1 (currently amended): An undulator ~~characterized by~~ comprising:

a first magnetic circuit for forming a periodic magnetic field;

a first support body for supporting the first magnetic circuit;

a second magnetic circuit arranged so as to be opposite to the first magnetic circuit, for forming a periodic magnetic field;

a second support body for supporting the second magnetic circuit;

a space formed between the oppositely arranged first and second magnetic circuits, for passing an electron beam;

a vacuum chamber for in-vacuuming the first magnetic circuit and the second magnetic circuit; ~~and~~

a cooling mechanism for cooling a permanent magnet constituting the first magnetic circuit and the second magnetic circuit below the room temperature;

a gap changing mechanism for changing ~~an~~ a gap of the space;

a refrigerant passing tube provided in the cooling mechanism, for passing a refrigerant; and

a connecting component for connecting the refrigerant passing tube to each of the first support body and the second support body,

wherein the connecting component has flexibility and allows the gap changing mechanism to change the gap.

2 (Canceled)

3 (original): The undulator according to claim 1, wherein the cooling mechanism comprises:

a first refrigerant passing tube provided to cool the first magnetic circuit, for passing the refrigerant; and

a second refrigerant passing tube provided to cool the second magnetic circuit, for passing the refrigerant, wherein the first refrigerant passing tube is fixed to the first support body and the second refrigerant passing tube is fixed to the second support body.

4 (original): The undulator according to claim 1, wherein the cooling mechanism comprises:

a first refrigerant passing tube provided to cool the first magnetic circuit, for passing the refrigerant; and

a second refrigerant passing tube provided to cool the second magnetic circuit, for passing the refrigerant, wherein the first refrigerant passing tube penetrates the inside of the first support body and the second refrigerant passing tube penetrates the inside of the second support body.

5 (currently amended): ~~The~~ A undulator ~~according to claim 1,~~ comprising:

a first magnetic circuit for forming a periodic magnetic field;

a first support body for supporting the first magnetic circuit;

a second magnetic circuit arranged so as to be opposite to the first magnetic circuit, for forming a periodic magnetic field;

a second support body for supporting the second magnetic circuit;

a space formed between the oppositely arranged first and second magnetic circuits, for passing an electron beam;

a vacuum chamber for in-vacuuming the first magnetic circuit and the second magnetic circuit;

a cooling mechanism for cooling a permanent magnet constituting the first magnetic circuit and the second magnetic circuit below the room temperature;

~~an~~ a gap changing mechanism for changing ~~an~~ a gap of the space;

a cooling head provided in the cooling mechanism and cooled by a freezing machine, and

a connecting component for connecting the cooling head to each of the first support body and the second support body, wherein

the connecting component has flexibility and allows the gap changing mechanism to change the gap.

6 (canceled)

7 (currently amended): ~~The~~ A undulator ~~according to claim 1,~~ comprising:

a first magnetic circuit for forming a periodic magnetic field;

a first support body for supporting the first magnetic circuit;

a second magnetic circuit arranged so as to be opposite to the first magnctic circuit, for forming a periodic magnetic field;

a second support body for supporting the second magnctic circuit;

a space formed between the oppositely arranged first and sccond magnetic circuits, for passing an electron beam;

a vacuum chamber for in-vacuuming the first magnetic circuit and the second magnetic circuit;

a cooling mechanism for cooling a permanent magnet constituting the first magnetic circuit and the second magnetic circuit below the room temperature;

a first temperature sensor for detecting a temperature of the first magnetic circuit;

a first heater for heating the first magnetic circuit;

a second temperature sensor for detecting a temperature of the second magnetic circuit;

a second heater for heating the second magnetic circuit; and

a temperature control unit for controlling the first heater and the second heater on the basis of temperature measured data provided by the first and second temperature sensors.

8 (canceled)

9 (currently amended): The undulator according to claim [[2]] 1, wherein a hollow part is formed in each of a first support shaft for supporting the first support body and a second support shaft for supporting the second support body.

10-11 (canceled)

12 (previously presented): The undulator according to claim 5, wherein a hollow part is formed in each of a first support shaft for supporting the first support body and a second support shaft for supporting the second support body.

13 (currently amended): The undulator according to claim [[2]] 1, further comprising:

a first temperature sensor for detecting a temperature of the first magnetic circuit;

a first heater for heating the first magnetic circuit;

a second temperature sensor for detecting a temperature of the second magnctic circuit;

a second heater for heating the second magnetic circuit; and

a temperature control unit for controlling the first heater and the second heater on the basis of temperature measured data provided by the first and second temperature sensors.

14 (currently amended): ~~The~~ A undulator ~~according to claim 3,~~ comprising:

a first magnetic circuit for forming a periodic magnetic field;

a first support body for supporting the first magnetic circuit;

a second magnetic circuit arranged so as to be opposite to the first magnetic circuit, for forming a periodic magnetic field;

a second support body for supporting the second magnetic circuit;

a space formed between the oppositely arranged first and second magnetic circuits, for passing an electron beam;

a vacuum chamber for in-vacuuming the first magnetic circuit and the second magnetic circuit;

a cooling mechanism for cooling a permanent magnet constituting the first magnetic circuit and the second magnetic circuit below the room temperature;

a first temperature sensor for detecting a temperature of the first magnetic circuit;

a first heater for heating the first magnetic circuit;

a second temperature sensor for detecting a temperature of the second magnctic circuit;

a second heater for heating the second magnetic circuit; and

a temperature control unit for controlling the first heater and the second heater on the basis of temperature measured data provided by the first and second temperature sensors,

wherein the cooling mechanism comprises:

a first refrigerant passing tube provided to cool the first magnetic circuit, for passing the refrigerant; and

a second refrigerant passing tube provided to cool the second magnetic circuit, for passing the refrigerant, wherein the first refrigerant passing tube is fixed to the first support body and the second refrigerant passing tube is fixed to the second support body.

15 (currently amended): ~~The~~ A undulator ~~according to claim 4,~~ comprising:

a first magnetic circuit for forming a periodic magnetic field;

a first support body for supporting the first magnetic circuit;

a second magnetic circuit arranged so as to be opposite to the first magnetic circuit, for forming a periodic magnetic field;

a second support body for supporting the second magnetic circuit;

a space formed between the oppositely arranged first and second magnetic circuits, for passing an electron beam;

a vacuum chamber for in-vacuuming the first magnetic circuit and the second magnetic circuit;

a cooling mechanism for cooling a permanent magnet constituting the first magnetic circuit and the second magnetic circuit below the room temperature;

a first temperature sensor for detecting a temperature of the first magnetic circuit;

a first heater for heating the first magnetic circuit;

a second temperature sensor for detecting a temperature of the second magnetic circuit;

a second heater for heating the second magnetic circuit; and

a temperature control unit for controlling the first heater and the second heater on the basis of temperature measured data provided by the first and second temperature sensors,

wherein the cooling mechanism comprises:

a first refrigerant passing tube provided to cool the first magnetic circuit, for passing the refrigerant; and

a second refrigerant passing tube provided to cool the second magnetic circuit, for passing the refrigerant, wherein the first refrigerant passing tube penetrates the inside of

the first support body and the second refrigerant passing tube penetrates the inside of the second support body.

16 (currently amended): The undulator according to claim 5, further comprising:

a first temperature sensor for detecting a temperature of the first magnetic circuit;

a first heater for heating the first magnetic circuit;

a second temperature sensor for detecting a temperature of the second magnetic circuit;

a second heater for heating the second magnetic circuit; and

a temperature control unit for controlling the first heater and the second heater on the basis of temperature measured data provided by the first and second temperature sensors.

17 (currently amended): ~~The~~ A undulator ~~according to claim 6,~~ comprising:

a first magnetic circuit for forming a periodic magnetic field;

a first support body for supporting the first magnetic circuit;

a second magnetic circuit arranged so as to be opposite to the first magnetic circuit, for forming a periodic magnetic field;

a second support body for supporting the second magnetic circuit;

a space formed between the oppositely arranged first and second magnetic circuits, for passing an electron beam;

a vacuum chamber for in-vacuuming the first magnetic circuit and the second magnetic circuit;

a cooling mechanism for cooling a permanent magnet constituting the first magnetic circuit and the second magnetic circuit below the room temperature;

a first temperature sensor for detecting a temperature of the first magnetic circuit;

a first heater for heating the first magnetic circuit;

a second temperature sensor for detecting a temperature of the second magnetic circuit;

a second heater for heating the second magnetic circuit; and

a temperature control unit for controlling the first heater and the second heater on the basis of temperature measured data provided by the first and second temperature sensors,

wherein a hollow part is formed in each of a first support shaft for supporting the first support body and a second support shaft for supporting the second support body.

18 (currently amended): The undulator according to claim [[2]] 1, ~~characterized in that~~ wherein each of the first support body and the second support body has a holder for mounting the permanent magnet, and a holder support for supporting the holder, and

a material of the holder has a thermal expansion coefficient greater than or equal to that of the holder support.

19 -20 (canceled)

21 (currently amended): The undulator according to claim 5, ~~characterized in that~~ wherein each of the first support body and the second support body has a holder for mounting the permanent magnet, and a holder support for supporting the holder, and

a material of the holder has a thermal expansion coefficient greater than or equal to that of the holder support.

22 (canceled)

23 (currently amended): The undulator according to claim 7, ~~characterized in that~~ wherein each of the first support body and the second support body has a holder for mounting the permanent magnet, and a holder support for supporting the holder, and

a material of the holder has a thermal expansion coefficient greater than or equal to that of the holder support.